Ryan Faddis Abstract

Elucidation of Optoelectric Properties of Pyrrolo[3,2-b]pyrrole Chromophores

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Derivatives of phenyl substituted pyrrolo[3,2-b]pyrroles have shown promise of being useful organic opto-electric compounds due to their advantageous tunability through careful synthetic design. Furthermore, one pot synthesis and readily accessible commercial reactants such as, aromatic amines and aldehydes, makes these molecules more favorable than other, more complex syntheses traditionally required for optically active organic molecules. Although relatively simple synthesize, more information from experimentation is needed to understand the optical properties of these species, and thus, a family of pyrrolo[3,2-b]pyrroles was created to provide results for our inquiries about the molecules optical characteristics. Each member of this family was provided a uniquely tuned π-system along the phenyls due to the presence of either an electron withdrawing group (nitro), electron donating group (methoxy), or electronically neutral group (methyl). When synthesized, the species showed a clear trend of yields that inversely correlated to the amount of activity found on the benzene rings substituents; this lent itself to insights into the mechanistic process of the synthesis. These molecules were then subjected to a series of experiments to elucidate their fundamental optoelectronic properties. Specifically, The UV-Vis absorbance spectroscopy provides insight into functional group influence on optical properties of neutral and oxidized species, while fluorescence and fluorescent quantum yield measurements reveal excited state relaxation pathways. Through the elucidation of these properties for this family of pyrrolo[3,2-b]pyrroles, a more apt understanding of the overall capabilities of the highly tailorable DPP scaffold can now be assessed.